

that it is by light reflected from the bottom of the eye that vision is affected, then the theory of the retina in primary vision becomes more consistent. The divergent pencil of light which proceeds from any visible point to the eye, becoming convergent after having entered the refractive media, passing through the perfectly transparent retina, is probably brought to a point at the surface of the choroid or outer part of the bacillary layer of the retina, and is not entirely absorbed there, but is reflected as a divergent pencil. In passing towards the point of reflection, the rays of the pencil cannot impress any part of the retina, because they cannot impinge on any of its nervous elements in the only manner in which these can be affected, viz: against their free extremities at a right angle. Certain of the rays, however, of the reflected pencil, viz: those which pass along the axis of a rod or cone in the bacillary layer, will impinge in the proper direction on the contained nerve, and produce the luminiferous impression. No confusion, therefore, can result from the multitude of convergent and divergent rays which are passing through the chamber of the eye, and through the retina, for those only are capable of impressing which are reflected along the axis of the cones and rods. The human sensorium receives from the retina the impression of a picture which is not continuous, but made up of detached points; as in the vision of the insect, which only sees an object by as many points as can transmit rays along the axis of its eye tubules.

Mr. Goodsir is of opinion that the bacillary layer of the retina belongs morphologically to the transparent humours of the eye. The original bulb of the eye, whether it be a mere process of the brain, or, as he is inclined to believe, partly a pulp developed on the tegumentary membrane, forms over its entire free surface transparent (cuticular) structures. That portion of the free surface of the pulp which is directed towards the orifice of the eye follicle, develops the lens, the cornea, and the vitreous humour. That portion, again, in contact with the inner surface of the follicle and which becomes choroid, develops the bacillary layer with its rods and cones. As the lens and vitreous humour increase in size, the pulp or retina becomes cup-shaped, and intermediate between the two portions of the transparent structure developed from its original spheroidal surface.—*Edinburgh Med. and Surg. Journ.*, Oct. 1855.

2. *Histology of the Retina.*—REMAK describes the structure of the retina at some length.¹ He states, that next to the "membrana limitans," extend, in the direction of the meridian of the eyeball, the textural fibre fasciculi. In the interval are crowded thickly placed multi-polar ganglion cells, which belong to the cell-layer existing on the outside of the optic nerve-layer. One may then discriminate, on the inner surface of the retina, fibrous and gangliated meridians. The branched projections of the ganglion cells have the properties of nerve-fibres, and unite with the third very thick fibrous layer, from which exceedingly delicate varicose fibres, like the fasciculi of the optic nerve, run from behind forwards. On this fibrous layer follows again a layer, consisting of small multi-polar ganglion cells, which in many places is separated by a very thin fibrous layer from the so-called granular layer. In the last one, neither nerve fibres nor ganglion cells appeared. It consisted of nuclei-holding fibres, arranged in a radial direction, which, on their extended nucleus-holding outer surface, are beset with the well-known little rods and pegs. Projections of these fibres pass through the layer of the retina in a radial direction, and form, by means of broader thickly crowded anastomosing enlargements, the "membrana limitans," without ever affording a resemblance to, or connection with, the nerve fibres. These radiating fibres, discovered by H. Müller, appear, like the limitary membrane from which they proceed, to serve the retina as a support. In the district of the "yellow spot" there run, according to Remak, the layers of the retina, consisting of nerve fibres and ganglion cells in a gangliated sheet, formed by multi-polar ganglion cells, whose thinned, pitcher-shaped, central part (*fovea optica*) in the sound eye of a boy, appeared to be perforated by a fissure. Up to this cavity a very thin projection of the inner fibrous layer passed, but here ceased the radiating fibres of Müller. The ganglion cells were

¹ Deutsche Klinik, No. 16: quoted from Canstatt. 1864.

surrounded by firm sheaths, from which proceeded the short stems of the pegs existing on the outer side. Between the above-named cavity and the choroid is a substance of deep yellow colour, clear as glass. In the other parts of the spot, the stems of the pegs are very long and twisted, and, as it appeared, form a thick, very yielding cushion, upon which the gangliated lamina rested.

For Külliker's observations on the extension and termination of the cochlear nerve of the ear, in which, to a certain extent, he agrees with Corti of Turin, see his *Histology*.

Wagner¹ considers that all so-called a-polar cells do not exist as such, but that, in all cases, excepting, perhaps, in those of the heart, about which there was doubt, they were mutilated bi- and multi-polar cells. He also considers that uni-polar cells in the brain and spinal cord are doubtful. Many apparently bi-polar cells in the brain he recognized as multi-polar, and he looks on the granular material between the cells as a bed for bloodvessels, and also as a matrix for the formation of new ganglion cells. The union of the ganglion cells described by him in the electric apparatus of the torpedo, could not be found by Remak, who asserts that the cells are all multi-polar, and that their processes partly enter into the roots of the electric nerves, and partly into the spinal cord. The cells in spinal ganglia were found by Remak to be bi-polar; but in the sympathetic ganglia they were multi-polar, with from three to twelve processes. They were more numerous in the solar plexus than in the terminal ganglia. In these ganglia, the bi-polar cells differed from those in the spinal ganglia, by the branching of both processes, so that they were equivalent to multi-polar cells.—*B. & F. Med.-Chirurg. Rev.*, Oct. 1855.

3. *Histology of the Cornea, Lenses of the Eye, &c.*—The presence of a true liquor Morgagni during life, which is denied by Külliker and others, is asserted by Lohmayer.² Külliker attributes the appearance of a layer of polygonal cells at the back part of the crystalline lens under the capsule, to club-shaped enlarged and flattened ends of the lens' fibres, which are inserted into the inner surface of the capsule, and often leave delicate impressions behind them; and in the same way, the abrupt terminations of the fibres of the lens exist behind the equator of the lens.³ Külliker also asserts that the fibres of the lens are, in fact, tubes, which Reichert⁴ thinks cannot be the case, from the completeness with which, on drying, their peculiar polyhedral character is retained. He imagines the fine and longitudinally striped character which they have to be owing to a folding of their membrane, probably. In the neighbourhood of the equator, the nuclei of the original cells of the tubes, having grown into vesicles with nucleoli, remain in the centre of each tube. Külliker says that, in the central stelliform figures of the lens, its substance does not consist of tubes, but is partly granular and partly homogeneous; and the surrounding tubes gradually lose their distinctness on approaching the central "stars." The vitreous body is described by Doncan⁵ as consisting of four kinds of elements: 1. A periphoric layer of cells, strongly refracting light. 2. Very fine fibres, covered with granules, which were situated more at the sides than in the axis of vision. 3. Numbers of granules, of various sizes. 4. Folded membranous shreds in the anterior part of the vitreous body. The cells, which are identical with those described by Luschka, and considered by Brücke to be undeveloped capillary network in the fœtus, fill the entire vitreous body, and disappear from the centre. Those existing at the periphery are looked upon by Doncan as the result of a colloid or mucin-like metamorphosis of the contents, especially the nucleus; and he thinks that the vitreous humour is developed from these cells, which, partly by bursting, and partly by the act of transudation, furnish the fluid. Doncan also thinks the textural parts, the fibre's granules, membranous shreds, &c., to be the result of secondary formations in the mucus, formed by

¹ Neurologische Untersuchung. See Canstatt, p. 61. 1854.

² Zeitschrift für rat. Med., Band v. Heft. 1, p. 56.

³ Zeitsch. für Wissensch. Zool., Band vi. Heft. 1.

⁴ Canstatt's Jahresbericht, p. 84. 1854.

⁵ Nederl. Lancet, Nos. 11, 12: see Canstatt.